

for real-time transmission.

DISCLOSURE OF THE INVENTION

With considering the above-mentioned problem, an object of the invention is to provide a transmitting apparatus, an image processing system, an image processing method, a program, and a recording medium in which no increase is caused in the amount of image data to be transmitted, and in which no load increase is caused in the traffic so that no degradation is caused in the immediacy necessary for real-time transmission.

In order to solve the above problem, the 1st aspect of the present invention is a transmitting apparatus of outputting a video signal generated by a video signal generating apparatus of generating said video signal consisting of frames, to a receiving apparatus having receiving means of receiving a transmitted video signal and output means of outputting said received video signal by means of scanning lines, said apparatus comprising:

block dividing means of zone-dividing said frame into a predetermined number of blocks in parallel to the scanning lines of said output means of said receiving apparatus;

region determining means of comparing each block of said predetermined frame generated by said block dividing means with each block corresponding to the block within

an immediately preceding frame of said predetermined frame, and thereby determining a rectangular region having a different pixel value;

extracting means of extracting a video signal included in (1) the determined rectangular region or (2) a rectangular region obtained from the determined rectangular region by applying a predetermined rule; and

transmitting means of coding the video signal extracted by said extracting means and then transmitting the signal to said receiving apparatus.

Furthermore, the 2nd aspect of the present invention is a transmitting apparatus of outputting a video signal generated by a video signal generating apparatus of generating said video signal consisting of even number fields and odd number fields, to a receiving apparatus having receiving means of receiving a transmitted video signal and output means of outputting said received video signal by means of scanning lines, said apparatus comprising:

block dividing means of zone-dividing said even number field or odd number field into a predetermined number of blocks in parallel to the scanning lines of said output means of said receiving apparatus;

region determining means of comparing each block of said even number field or odd number field generated by said block dividing means with each block corresponding

to the block within an immediately preceding even number field or odd number field of said predetermined even number field or odd number field, and thereby determining a rectangular region having a different pixel value;

extracting means of extracting a video signal included in (1) the determined rectangular region or (2) a rectangular region obtained from the determined rectangular region by applying a predetermined rule; and

transmitting means of coding the video signal extracted by said extracting means and then transmitting the signal to said receiving apparatus.

Furthermore, the 3rd aspect of the present invention is a transmitting apparatus according to the 1st or the 2nd aspect of the present invention, wherein said predetermined rule is that when each of said blocks adjacent in a horizontal or vertical direction has a rectangular region determined by said region determining means, a rectangular region is generated that includes both of the rectangular regions of said blocks adjacent in a horizontal or vertical direction.

Furthermore, the 4th aspect of the present invention is a transmitting apparatus according to the 3rd aspect of the present invention, wherein said region that includes both of the rectangular regions of said blocks adjacent in a horizontal or vertical direction indicates a minimum

rectangular region that includes both of said rectangular regions of said blocks adjacent in a horizontal or vertical direction.

Furthermore, the 5th aspect of the present invention is a transmitting apparatus according to the 1st or the 2nd aspect of the present invention, wherein said predetermined rule is that when each of said blocks adjacent in a horizontal or vertical direction has a rectangular region determined by said region determining means and when these rectangular regions contact with each other in a horizontal or vertical direction, a rectangular region is generated that includes both of the rectangular regions of said blocks adjacent in a horizontal or vertical direction.

Furthermore, the 6th aspect of the present invention is a transmitting apparatus according to the 5th aspect of the present invention, wherein said rectangular region that includes both of the rectangular regions of said blocks adjacent in a horizontal or vertical direction indicates a minimum rectangular region that includes both of said rectangular regions of said predetermined blocks adjacent in a horizontal or vertical direction.

Furthermore, the 8th aspect of the present invention is a transmitting apparatus according to the 1st or the 2nd aspect of the present invention, wherein said region determining means determines said rectangular region in

parallel to the scanning lines of said output means of said receiving apparatus.

Furthermore, the 10th aspect of the present invention is a transmitting apparatus according to the 1st or the 2nd aspect of the present invention, wherein:

said transmitting apparatus serves also as said video signal generating apparatus;

said transmitting apparatus and said video signal generating apparatus are a personal computer; and

said receiving apparatus is a liquid crystal display projector, a DLP projector, or a PDP.

Furthermore, the 11th aspect of the present invention is an image processing system comprising:

a receiving apparatus having receiving means of receiving a transmitted video signal and output means of outputting said received video signal by means of scanning lines;

a video signal generating apparatus of generating a video signal consisting of frames;

block dividing means of zone-dividing said frame into a predetermined number of blocks in parallel to the scanning lines of said output means of said receiving apparatus; and

a transmitting apparatus having: region determining means of comparing each block of said predetermined frame

generated by said block dividing means with each block corresponding to the block within an immediately preceding frame of said predetermined frame, and thereby determining a rectangular region having a different pixel value; extracting means of extracting a video signal included in (1) the determined rectangular region or (2) a rectangular region obtained from the determined rectangular region by applying a predetermined rule; and transmitting means of coding the video signal extracted by said extracting means and then transmitting the signal to said receiving apparatus.

Furthermore, the 12th aspect of the present invention is an image processing system comprising:

a receiving apparatus having receiving means of receiving a transmitted video signal and output means of outputting said received video signal by means of scanning lines;

a video signal generating apparatus of generating a video signal consisting of even number fields and odd number fields; and

a transmitting apparatus having: block dividing means of zone-dividing said even number field or odd number field into a predetermined number of blocks in parallel to the scanning lines of said output means of said receiving apparatus; region determining means of comparing each block

of said even number field or odd number field generated by said block dividing means with each block corresponding to the block within an immediately preceding even number field or odd number field of said predetermined even number field or odd number field, and thereby determining a rectangular region having a different pixel value; extracting means of extracting a video signal included in (1) the determined rectangular region or (2) a rectangular region obtained from the determined rectangular region by applying a predetermined rule; and transmitting means of coding the video signal extracted by said extracting means and then transmitting the signal to said receiving apparatus.

Furthermore, the 15th aspect of the present invention is an image processing system according to the 11th or the 12th aspect of the present invention, wherein:

said transmitting apparatus serves also as said video signal generating apparatus;

said video signal generating apparatus and said transmitting apparatus are a personal computer; and

said receiving apparatus is a liquid crystal display projector, a DLP projector, or a PDP.

Furthermore, the 17th aspect of the present invention is an image processing method of outputting a video signal generated by a video signal generating apparatus of

generating said video signal consisting of frames, to a receiving apparatus having receiving means of receiving a transmitted video signal and output means of outputting said received video signal by means of scanning lines, said method comprising:

a block dividing step of zone-dividing said frame into a predetermined number of blocks in parallel to the scanning lines of said output means of said receiving apparatus;

a region determining step of comparing each block of said predetermined frame generated at said block dividing step with each block corresponding to the block within an immediately preceding frame of said predetermined frame, and thereby determining a rectangular region having a different pixel value;

an extracting step of extracting a video signal included in (1) the determined rectangular region or (2) a rectangular region obtained from the determined rectangular region by applying a predetermined rule; and

a transmitting step of coding the video signal extracted at said extracting step and then transmitting the signal to said receiving apparatus.

Furthermore, the 18th aspect of the present invention is an image processing method of outputting a video signal generated by a video signal generating apparatus of generating said video signal consisting of even number

fields and odd number fields, to a receiving apparatus having receiving means of receiving a transmitted video signal and output means of outputting said received video signal by means of scanning lines, said method comprising:

a block dividing step of zone-dividing said even number field or odd number field into a predetermined number of blocks in parallel to the scanning lines of said output means of said receiving apparatus;

a region determining step of comparing each block of said even number field or odd number field generated at said block dividing step with each block corresponding to the block within an immediately preceding even number field or odd number field of said predetermined even number field or odd number field, and thereby determining a rectangular region having a different pixel value;

an extracting step of extracting a video signal included in (1) the determined rectangular region or (2) a rectangular region obtained from the determined rectangular region by applying a predetermined rule; and

a transmitting step of coding the video signal extracted at said extracting step and then transmitting the signal to said receiving apparatus.

Furthermore, the 19th aspect of the present invention is a program of causing a computer to serve, in a transmitting apparatus according to the 1st aspect of the present

invention, as:

block dividing means of zone-dividing said frame into a predetermined number of blocks in parallel to the scanning lines of said output means of said receiving apparatus;

region determining means of comparing each block of said predetermined frame generated by said block dividing means with each block corresponding to the block within an immediately preceding frame of said predetermined frame, and thereby determining a rectangular region having a different pixel value;

extracting means of extracting a video signal included in (1) the determined rectangular region or (2) a rectangular region obtained from the determined rectangular region by applying a predetermined rule; and

transmitting means of coding and transmitting the video signal extracted by said extracting means, in accordance with said receiving apparatus.

Furthermore, the 20th aspect of the present invention is a program of causing a computer to serve, in a transmitting apparatus according to the 2nd aspect of the present invention, as:

block dividing means of zone-dividing said even number field or odd number field into a predetermined number of blocks in parallel to the scanning lines of said output means of said receiving apparatus;

region determining means of comparing each block of said even number field or odd number field generated by said block dividing means with each block corresponding to the block within an immediately preceding even number field or odd number field of said predetermined even number field or odd number field, and thereby determining a rectangular region having a different pixel value;

extracting means of extracting a video signal included in (1) the determined rectangular region or (2) a rectangular region obtained from the determined rectangular region by applying a predetermined rule; and

transmitting means of coding the video signal extracted by said extracting means and then transmitting the signal to said receiving apparatus.

Furthermore, the 21st aspect of the present invention is a computer-processible recording medium which carries a program according to the 19th or the 20th aspect of the present invention.

According to the present invention, difference regions present at distant positions can be regarded as independent regions. This provides the effect of reducing the occasion of transmitting a region that is not a difference

CLAIMS

1. (Amended) A transmitting apparatus of outputting a video signal generated by a video signal generating apparatus of generating said video signal consisting of frames, to a receiving apparatus having receiving means of receiving a transmitted video signal and output means of outputting said received video signal by means of scanning lines, said apparatus comprising:

block dividing means of zone-dividing said frame into a predetermined number of blocks in parallel to the scanning lines of said output means of said receiving apparatus;

region determining means of comparing each block of said predetermined frame generated by said block dividing means with each block corresponding to the block within an immediately preceding frame of said predetermined frame, and thereby determining a rectangular region having a different pixel value;

extracting means of extracting a video signal included in (1) the determined rectangular region or (2) a rectangular region obtained from the determined rectangular region by applying a predetermined rule; and

transmitting means of coding the video signal extracted by said extracting means and then transmitting the signal to said receiving apparatus.

2. (Amended) A transmitting apparatus of outputting a video signal generated by a video signal generating apparatus of generating said video signal consisting of even number fields and odd number fields, to a receiving apparatus having receiving means of receiving a transmitted video signal and output means of outputting said received video signal by means of scanning lines, said apparatus comprising:

block dividing means of zone-dividing said even number field or odd number field into a predetermined number of blocks in parallel to the scanning lines of said output means of said receiving apparatus;

region determining means of comparing each block of said even number field or odd number field generated by said block dividing means with each block corresponding to the block within an immediately preceding even number field or odd number field of said predetermined even number field or odd number field, and thereby determining a rectangular region having a different pixel value;

extracting means of extracting a video signal included in (1) the determined rectangular region or (2) a rectangular region obtained from the determined rectangular region by applying a predetermined rule; and

transmitting means of coding the video signal

extracted by said extracting means and then transmitting the signal to said receiving apparatus.

3. (Amended) A transmitting apparatus according to claim 1 or 2, wherein said predetermined rule is that when each of said blocks adjacent in a horizontal or vertical direction has a rectangular region determined by said region determining means, a rectangular region is generated that includes both of the rectangular regions of said blocks adjacent in a horizontal or vertical direction.

4. (Amended) A transmitting apparatus according to claim 3, wherein said region that includes both of the rectangular regions of said blocks adjacent in a horizontal or vertical direction indicates a minimum rectangular region that includes both of said rectangular regions of said blocks adjacent in a horizontal or vertical direction.

5. (Amended) A transmitting apparatus according to claim 1 or 2, wherein said predetermined rule is that when each of said blocks adjacent in a horizontal or vertical direction has a rectangular region determined by said region determining means and when these rectangular regions contact with each other in a horizontal or vertical direction, a rectangular region is generated that includes both of

the rectangular regions of said blocks adjacent in a horizontal or vertical direction.

6. (Amended) A transmitting apparatus according to claim 5, wherein said rectangular region that includes both of the rectangular regions of said blocks adjacent in a horizontal or vertical direction indicates a minimum rectangular region that includes both of said rectangular regions of said predetermined blocks adjacent in a horizontal or vertical direction.

7. (Deleted).

8. (Amended) A transmitting apparatus according to claim 1 or 2, wherein said region determining means determines said rectangular region in parallel to the scanning lines of said output means of said receiving apparatus.

9. (Deleted).

10. (Amended) A transmitting apparatus according to claim 1 or 2, wherein:

said transmitting apparatus serves also as said video signal generating apparatus;

said transmitting apparatus and said video signal generating apparatus are a personal computer; and

said receiving apparatus is a liquid crystal display projector, a DLP projector, or a PDP.

11. (Amended) An image processing system comprising:

a receiving apparatus having receiving means of receiving a transmitted video signal and output means of outputting said received video signal by means of scanning lines;

a video signal generating apparatus of generating a video signal consisting of frames;

block dividing means of zone-dividing said frame into a predetermined number of blocks in parallel to the scanning lines of said output means of said receiving apparatus; and

a transmitting apparatus having: region determining means of comparing each block of said predetermined frame generated by said block dividing means with each block corresponding to the block within an immediately preceding frame of said predetermined frame, and thereby determining a rectangular region having a different pixel value; extracting means of extracting a video signal included in (1) the determined rectangular region or (2) a rectangular region obtained from the determined rectangular region by

applying a predetermined rule; and transmitting means of coding the video signal extracted by said extracting means and then transmitting the signal to said receiving apparatus.

12. (Amended) An image processing system comprising:

a receiving apparatus having receiving means of receiving a transmitted video signal and output means of outputting said received video signal by means of scanning lines;

a video signal generating apparatus of generating a video signal consisting of even number fields and odd number fields; and

a transmitting apparatus having: block dividing means of zone-dividing said even number field or odd number field into a predetermined number of blocks in parallel to the scanning lines of said output means of said receiving apparatus; region determining means of comparing each block of said even number field or odd number field generated by said block dividing means with each block corresponding to the block within an immediately preceding even number field or odd number field of said predetermined even number field or odd number field, and thereby determining a rectangular region having a different pixel value; extracting means of extracting a video signal included in

(1) the determined rectangular region or (2) a rectangular region obtained from the determined rectangular region by applying a predetermined rule; and transmitting means of coding the video signal extracted by said extracting means and then transmitting the signal to said receiving apparatus.

13. (Deleted).

14. (Deleted).

15. (Amended) An image processing system according to claim 11 or 12, wherein:

said transmitting apparatus serves also as said video signal generating apparatus;

said video signal generating apparatus and said transmitting apparatus are a personal computer; and

said receiving apparatus is a liquid crystal display projector, a DLP projector, or a PDP.

16. (Deleted).

17. (Amended) An image processing method of outputting a video signal generated by a video signal generating apparatus of generating said video signal

consisting of frames, to a receiving apparatus having receiving means of receiving a transmitted video signal and output means of outputting said received video signal by means of scanning lines, said method comprising:

a block dividing step of zone-dividing said frame into a predetermined number of blocks in parallel to the scanning lines of said output means of said receiving apparatus;

a region determining step of comparing each block of said predetermined frame generated at said block dividing step with each block corresponding to the block within an immediately preceding frame of said predetermined frame, and thereby determining a rectangular region having a different pixel value;

an extracting step of extracting a video signal included in (1) the determined rectangular region or (2) a rectangular region obtained from the determined rectangular region by applying a predetermined rule; and

a transmitting step of coding the video signal extracted at said extracting step and then transmitting the signal to said receiving apparatus.

18. (Amended) An image processing method of outputting a video signal generated by a video signal generating apparatus of generating said video signal consisting of even number fields and odd number fields,

to a receiving apparatus having receiving means of receiving a transmitted video signal and output means of outputting said received video signal by means of scanning lines, said method comprising:

a block dividing step of zone-dividing said even number field or odd number field into a predetermined number of blocks in parallel to the scanning lines of said output means of said receiving apparatus;

a region determining step of comparing each block of said even number field or odd number field generated at said block dividing step with each block corresponding to the block within an immediately preceding even number field or odd number field of said predetermined even number field or odd number field, and thereby determining a rectangular region having a different pixel value;

an extracting step of extracting a video signal included in (1) the determined rectangular region or (2) a rectangular region obtained from the determined rectangular region by applying a predetermined rule; and

a transmitting step of coding the video signal extracted at said extracting step and then transmitting the signal to said receiving apparatus.

19. (Amended) A program of causing a computer to serve, in a transmitting apparatus according to claim 1, as:

block dividing means of zone-dividing said frame into a predetermined number of blocks in parallel to the scanning lines of said output means of said receiving apparatus;

region determining means of comparing each block of said predetermined frame generated by said block dividing means with each block corresponding to the block within an immediately preceding frame of said predetermined frame, and thereby determining a rectangular region having a different pixel value;

extracting means of extracting a video signal included in (1) the determined rectangular region or (2) a rectangular region obtained from the determined rectangular region by applying a predetermined rule; and

transmitting means of coding and transmitting the video signal extracted by said extracting means, in accordance with said receiving apparatus.

20. (Amended) A program of causing a computer to serve, in a transmitting apparatus according to claim 2, as:

block dividing means of zone-dividing said even number field or odd number field into a predetermined number of blocks in parallel to the scanning lines of said output means of said receiving apparatus;

region determining means of comparing each block of said even number field or odd number field generated by

said block dividing means with each block corresponding to the block within an immediately preceding even number field or odd number field of said predetermined even number field or odd number field, and thereby determining a rectangular region having a different pixel value;

extracting means of extracting a video signal included in (1) the determined rectangular region or (2) a rectangular region obtained from the determined rectangular region by applying a predetermined rule; and

transmitting means of coding the video signal extracted by said extracting means and then transmitting the signal to said receiving apparatus.

21. A computer-processible recording medium which carries a program according to claim 19 or 20.